of the International Egg Laying Contest at Storrs during the year 1913–'14 and 1914–'15 [3] are laid beside those presented here from the Vineland data.

The essential constants appear in the accompanying table. This gives the per cent. of the flock which did and which did not lay during the months of the first year in which any considerable proportion of the birds did not lay. The average annual production for these birds in the first year of both the Storrs (1913–'14 and 1914–'15) and the Vineland (1916–'17) contests and in the second year (1917–'18) of the Vineland contest are shown. While the actual differences in egg production are the data of practical significance, comparison between the three series is facilitated by expressing the differences between these annual means for the birds of the two classes as percentages of the actual annual average productions[4] of the flock.

Considering first the records of the pullet year we note that for the Storrs series the birds which laid in any given month show an average annual (pullet year) egg production of from 27.4 to 82.8 eggs higher than those which did not lay or from 17.9 to 54.1 per cent. For the Vineland series the difference in the production of the two groups ranges from 36.7 to 65.5 eggs or from 21.1 to 37.6 per cent. Thus the difference in the annual egg production of the birds which did and which did not lay in any given month, as well as the percentage of the birds which are not laying, varies greatly according to the month considered. During the months of November, December and January the percentage differences in the annual production of the two groups of birds is higher in the Vineland than in the Storrs series whereas for the other months of the eight considered the reverse is true. The average percentage difference is 30.4 in the Storrs series and 26.6 in the Vineland series.

[3] Harris, Blakeslee and Kirkpatrick, *loc. cit.*, p. 42.

[4] These are 153.19 eggs for the first year at Storrs, 174.05 eggs for the first year at Vineland, and 139.79 eggs for the second year at Vineland.

Thus the constants show conspicuous differences of great practical significance in the first (pullet) year records of birds which did and those which did not lay during the individual months of the first year. The results for the first year records at Storrs and the first year records at Vineland are in fair agreement.

Turning to the second year means we note that for each of the eight months of the first year used as a basis of selection for an increase of second year production, the second year record of birds is higher if they laid during the special month under consideration in the first year than if they did not lay in that month. The differences between the groups amount to about two dozen eggs or more per bird in five of the eight months considered.

It is clear, therefore, that so simple a criterion as laying *vs.* non laying in the first year may furnish a criterion of some value for the selection of the birds to be retained in the flock for breeding and for second year production.

J. Arthur Harris,
Harry R. Lewis

THE AMERICAN CHEMICAL SOCIETY

(continued)

DIVISION OF INDUSTRIAL AND ENGINEERING CHEMISTRY

H. D. Batchelor, *chairman*
H. E. Howe, *secretary*

Symposium on Drying. Charles O. Lavett, *chairman*

The rate of drying of solid materials: W. K. Lewis.

The theory of atmospheric evaporation: W. H. Carrier.

The compartment dryer: W. C. Carrier and A. E. Stacey. A discussion of the relative merits of the continuous and compartment dryers.

Direct heat rotary drying apparatus: R. G. Merz. The paper was treated under the following heads: (1) The kinds and characteristics of direct heat rotary dryers. (2) The fields of application of such drying apparatus to the industries where they can be used to advantage. (3) The

advantages and limitations of these machines. (4) Efficiency is dependent upon the physical characteristics of the material to be handled, the initial and final moisture contents, the kind of fuel employed and the method of application of the drying medium. (5) When use of waste heat from other processes is advisable and economical.

Tunnel dryers: GRAHAME B. RIDLEY. For the purposes of this paper, tunnel dryers are limited to those having material on trays which are moved progressively through a tunnel which is supplied with a current of heated air from which all the heat used for drying is obtained and by which all the moisture is removed. Details of their operation were described.

The spray process: R. S. FLEMING.

Vacuum drying: CHAS. O. LAVETT and D. J. VAN MARLE. The paper gave an outline of the principles of vacuum drying, in particular the heat transmission and the influence of the vacuum on the temperature and rate of evaporation. A more detailed description was given of the vacuum shelf, rotary and drum dryer, their construction, application and cost of operation.

Tests on counter-current kelp driers: G. C. SPENCER and E. B. SMITH. Details were given of tests made at the kelp-potash plant of the U. S. Bureau of Soils at Summerland, Calif., during the year 1918.

The preparation, properties and constitution of liquid and solid water-glasses: LOUIS SCHNEIDER. Liquid water-glass may be prepared by a number of methods, of which the furnace process is at present the most widely employed in this country. Solid water-glass may be produced by dehydration, hydration, synthetic and crystallization methods. A practical crystallization method is unfortunately limited to the meta-silicate ratio. A continuous dehydration method at atmospheric pressure offers the best means of attaining a stable and completely soluble water-glass at a low cost. A number of important properties of liquid and solid water-glasses, as well as of sodium meta-silicate crystals and silicic acid hydrogels, have been fully described. It has been shown that solution and not dilution occurs when a solid water-glass is mixed with water. Viscosity is mainly a function of the sodium meta-silicate content. The free causticity of concentrated liquid water-glasses may be ascertained by the attainment of the heat of solution of a hydrated silica in the concentrated liquid water-glass and in a dilute caustic soda solution. It has been established (*a*) that a liquid water-glass is primarily a solution of sodium meta-silicate, silicic acid and, if the maximum solubility of the latter is exceeded, silicic acid hydrogel; and (*b*) that a solid water-glass, above the ratio of 1 Na_2O : 1SiO_2, is a mixture of hydrated sodium meta-silicate and an incompletely dehydrated silicic acid hydrogel. A system of nomenclature has been proposed to eliminate the prevalent indefiniteness of the terms employed in the literature and the trade.

Method for treating filter cake obtained in refining vegetable and animal oils: CHARLES BASKERVILLE. According to the Baskerville process, vegetable and animal oils are refined by treating with caustic, a determined amount of cellulose such as paper pulp or "linters" being mixed in with the oil, and heating to a "break." The soap particles are hardened and colloids are agglomerated by the further addition of anhydrous sodium sulphate or sodium carbonate. The insoluble mass thus produced is filtered out. The filter cake obtained may be subjected to squeezing in another press whereby some whole oil is recovered and a more compact cake results. The author also devised a process for recovering the remaining whole oil and the fatty acids in the cake. It depends upon cooking up the cake with an acid solution and running the completely disintegrated acid mass, the linters or paper pulp forming a filtering medium, which makes a complete separation of the hot mixture of free fatty acids and water solutions of salts and acids from the fiber. The free fatty acids and the whole oils rise to the top of the mixture and may be separated by any of several well-known methods, washed with hot water, the product being thus converted into a soap making material containing approximately fifty per cent. free fatty acids and fifty per cent. whole oil. A patent covering the process has been applied for.

The application of the Cottrell precipitator to the wood distillation process: L. F. HAWLEY and H. M. PIER. Recent experiments on a wood distillation retort holding about 75 pounds of wood have shown that the Cottrell precipitator can remove from the vapors coming from the retort practically all of the tar. The pitch formed during the distillation of the wood is non-volatile and is carried over to the condenser in the form of a fog of fine particles. If the precipitator is kept at too high temperature the pitch precipitated is so hard that it builds up across the tubes and causes short

circuiting. If, however, the precipitator is operated at a temperature near the boiling point of water a certain amount of oil and water is precipitated with the pitch so that a thin liquid is precipitated which does not cause short circuiting. By the application of the precipitator in this way it is hoped to be able to provide a pyroligneous acid direct from the condenser in sufficient purity so that it will not have to be redistilled to remove the tar.

Alcohol and chemical industries: J. M. Doran. The present and future development of our chemical industries, notably our dye industry, is intimately bound up with our alcohol industry. The eighteenth amendment to the Constitution and the Volstead Act affect this key industry far more vitally than the average chemist is aware. Title III. of the National Prohibition Act accords special treatment under the law to industrial alcohol but overshadowing all are the prohibition features of Title II. of the same act wherein alcohol is defined as intoxicating liquor and subject to the restrictions surrounding intoxicating liquor. In order to free the alcohol industry and dependent and allied chemical industries from the strangling rules surrounding liquor under which no industry can prosper, it is of utmost importance that alcohol be divested of its beverage character. The handling and use of pure alcohol in any industry is now a liability rather than an asset. Under the denaturing provisions of the National Prohibition Act it is possible both to enforce prohibition and assure the healthy development of industrial alcohol. The solution of this problem is essential if we are to have a healthy chemical industry.

The caustic calcination of dolomite and its use in sorrel cements: G. A. Bole and J. B. Shaw. Magnesium limestones can not be burned successfully by present methods as the calcium carbonate gives rise to free lime which is detrimental to the sorrel reaction. The pressure of carbon dioxide may be so regulated as to prevent the liberation of free lime. An oxide produced at 700 to 750° C. is superior to that burned at any other temperature-data given. All dolomites do not act alike in calcining but some dissociate at a much lower temperature than others. The conclusion is drawn that when properly burned, *i.e.*, temperature and pressure controlled, some dolomites, but not all, will produce an oxide well suited for stucco mixes.

Valuation of oil-bearing seeds by free fatty acid of the oil: Lehman Johnson. The petrolic ether extract from 16 grams of cotton seed thoroughly dried at 103° C. was titrated for free fatty acid and found to bear a true relation to the free fatty acid of the hydraulically expressed oil. This test will serve to determine the quality and proximate refining loss where the alkaline method of refining is to be employed on the oil. It is suggested as a more scientific and fairer method of valuing cotton seed than the "out and count" of damaged seed method now in use. It is probably applicable to other oil-bearing seeds.

The detection of carbon monoxide: C. R. Hoover. Carbon monoxide reacts at ordinary temperature with mixtures of iodine pentoxide and fuming sulfuric acid to give carbon dioxide and iodine or compounds of oxides of iodine and sulfur. With excess of sulfur trioxide colors are obtained varying with the concentration of carbon monoxide from pale green to dark brown. This reaction has been applied to the detection of carbon monoxide and other reducing gases. In the laboratory simple apparatus enables one to determine carbon monoxide quantitatively when present in amounts varying from .01 per cent. to 1 per cent. Two simple portable devices have been constructed by means of which an approximate quantitative determination of carbon monoxide from .03 per cent. to 1 per cent. can be carried out in thirty seconds.

Microscopic illumination with reference to Brownian movement and combination lightning: A. Silverman. Brownian movement can be studied against a black background by direct illumination from a ring lamp surrounding the objective. This results in a marked contrast and gives unusual definition to the particles. Second, the use of combination lighting from the ring lamp for opaque objects imbedded in transparent media results in the desired contrast between the object and medium and shows the details of the object itself by the reflected light. This is accomplished by placing the concave mirror parallel to the stage of the microscope so that the light travels through the transparent medium to the substage reflector and is sent up again to produce the contrast. The details in the opaque object are obtained by the direct light from above.

The relation of structures to free alkali in sodium silicate solutions: William Stericker. Although the general opinion is that solutions of sodium silicate contain large quantities of free alkali, they probably do not. The misconception is due to a lack of a satisfactory method for the determination of the degree of hydrolysis. Ultramicroscopic examination proves that sodium silicate

solutions are two-phase systems in which the dispersed phase has a negative charge. Probably hydroxyl ions are absorbed on the particles and attract sodium ions to form double layers which cause higher concentrations of alkali at the interfaces than elsewhere in the solution. This hypothesis explains discrepancies between the results from various methods.

Compression evaporation: A new method of concentrating liquids developed in Europe recently: GUSTAV CARLSSON.

Action of lime on greensand: R. NORRIS SHREVE. The Eastern Potash Corporation has under construction at New Brunswick, N. J., a large plant for obtaining caustic potash and other potash compounds from greensand. The main reaction in the process is the action of lime in decomposing greensand whereby caustic potash is liberated and a valuable residue obtained, which possesses considerable cementitious properties. In the reaction the lime attacks the greensand, or rather the glauconite contained therein, when heated with the greensand in the presence of water and at elevated temperatures and under sufficient pressure to keep the water in the liquid phase.

A modification of the acetate method for estimating iron and albumen in phosphates: F. P. VEITCH and H. P. HOLMAN. As a result of cooperative work with the fertilizer division of the American Chemical Society and also independent investigations, certain modifications have been made in the acetate method for estimating iron and aluminum in the presence of lime and phosphoric acid. This method, in substantially its present form, was submitted by the authors to the committee on research and analytical methods of the fertilizer division and was published as a part of that committee's report on phosphate rock in *Journal of Industrial and Engineering Chemistry*, 7, pp. 446–448. The present article made further modifications as a result of subsequent work, discussed the reasons for the conditions described as necessary for accurate results by this method, and gave results obtained on solutions of known compositions.

The water resistance of treated canvas during continuous exposure to weather: F. P. VEITCH and T. D. JARRELL. This paper gives a detailed report on the water resistance of gray 12 oz. U. S. standard army duck, which had been treated with eighteen formulas developed in the Bureau of Chemistry. The degree of water resistance was determined in the laboratory by modified funnel and modified spray methods and also in actual service by exposure to weather for 14 months. General conclusions are drawn as to the effectiveness of the various treatments. The treatments which have proved most serviceable by exposure test have also given high results by the funnel test. However, not all treatments showing a high rating by the funnel test have proven highly serviceable in those cases where water lay for some time on the canvas.

The detection and estimation of coal tar oils in turpentine: V. E. GROTLISCH and W. C. SMITH. The method outlined includes the following steps: (1) passing dry hydrogen chloride gas into the liquid, thus converting the pinene into crystalline pinene hydrochloride, also raising the boiling points of the unprecipitated reaction products; (2) distillation of the filtrate under reduced pressure to separate the coal tar oils with a minimum of terpene bodies; (3) sulphonation of the distillate with fuming sulphuric acid, thereby destroying terpenes and converting coal tar hydrocarbons into sulphonic acids; (4) dilution and steam distillation of the sulphonation mixture to remove undecomposed terpenes or mineral oils; (5) direct distillation of the sulphonation mixture to break up the sulphonic acids, with recovery of the coal tar hydrocarbons.

CHARLES L. PARSONS,
Secretary

THE ROYAL SOCIETY OF CANADA

THE following papers were presented before the Mathematical, Physical and Chemical Section of the Royal Society of Canada at the meeting held in Ottawa on May 18, 19 and 20:

Presidential Address.—"Division in relation to the algebraic numbers," by Professor J. C. Fields. "Ionization potential and the size of the atom," by Professor A. S. Eve. "Detection of variation in electric earth currents by coil and galvanometer," by Professor A. S. Eve and Mr. E. S. Biehler. "The effective range of beta-rays," by Miss V. Douglas and Dr. J. A. Gray. "The velocity of sound in air and soil; Properties of x-rays excited by beta-rays; The absorption of gamma-rays; A note on the examination of materials by x-rays," by Dr. J. A. Gray. "The transmission of heat through the thin boundary films of air or of water at the surface of glass," by Dr. A. Norman Shaw and Mr. L. S. Smith.